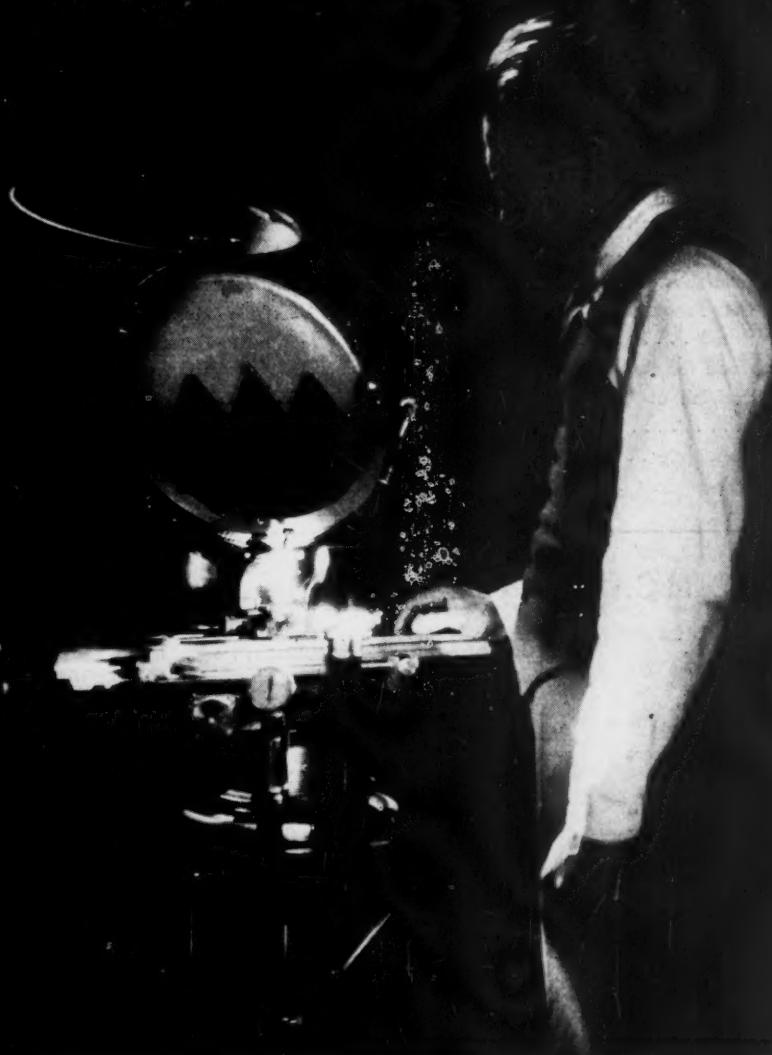


Industrial Standardization

and Commercial Standards Monthly



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September

WORLD STANDARDS NEWS

1935

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SEPTEMBER
1935

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No. 9

Some Fundamental Principles of Screw Thread Standardization

by

Ralph E. Flanders¹

*Chairman, Sectional Committee
on Standardization of Screw Threads*

THE screw thread is a simple device, but it ties together the whole mechanical skeleton of our civilization. It is doubtful whether any combination of substitutes, such as wedges, nails, rivets, cotter pins, welding, etc., could have been devised to completely fill its place. It is difficult to imagine the steamship, the locomotive, the motor car, or the airplane successfully built without screws, bolts, and nuts. These threaded parts are essential components of our culture.

In spite of the importance of the screw thread, it has had little attention until within the last few years. Basic forms and thread series were long ago adopted in England, America, and Continental Europe, but no critical study was given to their proportions, nor was manufacture on an interchangeable basis generally possible.

The World War changed all of this. Interchangeable manufacture of parts in separate shops, to be assembled in distant establishments, or in the field, made thread standardization in all its elements a necessity. An immense amount of study and experiment was therefore turned

When the Screw Thread Standard was recently approved as an American Standard by the American Standards Association, an important mile-stone in standardization was established.

The far-reaching significance of this work makes it one of the brilliant achievements in the record of industrial standardization.

toward the subject, and as a result all industrial countries have re-organized their screw-threading practice.

The first revision (April, 1935) of the American (National) Screw Thread Standard represents an important milestone in mechanical progress. It is the embodiment in usable form of theoretical desirability combined with practical possibility. This combination has been developed in active shop practice to meet actual requirements. In view of this, it is desirable to present a review of the elements of screw thread standardization on which this work was based.

Purposes of Standardization

The purposes of standardization are to produce a product which (a) is interchangeable, (b) functions properly in use, and (c) can be economically produced. These three phases of the problem will be taken up in their order.

Interchangeability. Of the three, this is the most easily obtained. Little more is required than

¹President, Jones & Lamson Machine Company; President, American Society of Mechanical Engineers; member, Industrial Advisory Board, and Business Advisory and Planning Council.

Our Front Cover

Checking the accuracy of a screw thread profile by means of a comparator. This apparatus can be used in a dark room, as shown here, or in daylight. Courtesy, Jones & Lamson Machine Company.

Our back cover shows a variety of screwed products. Courtesy, Pheoll Manufacturing Company.

Widely Representative Committee Revises Screw Thread Standard

Organizations with a wide range of interest, indicating the extent of the field in which the newly approved American Standard on Screw Threads will be applied, were represented on the committee of the American Standards Association which revised the screw thread standard.

The American Society of Mechanical Engineers and the Society of Automotive Engineers are sponsors for the work of the committee.

The members of the committee are:
Ralph E. Flanders, American Society of Mechanical Engineers, *Chairman*
Earle Buckingham, Society of Automotive Engineers, *Secretary*

American Society of Mechanical Engineers, *Ralph E. Flanders, Arthur M. Houser, Paul V. Miller*
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U. S. War Department, Air Corps, *Chief Experimental Engineering Section*

U. S. War Department, Ordnance Department, *Harry B. Hambleton*

Members-at-large, *Henry E. Bilger, Elmer J. Bryant, A. H. Knight, F. C. Leiner, W. E. McCombs, W. J. Outcalt, E. A. Thatcher, George T. Trundle*

to provide for the indefinite duplication of "go" gages in some form—as, for instance, a ring gage for bolts or screws, and a plug gage for nuts and tapped holes. If none of the plug gages will screw into any of the ring gages except with difficulty—or not at all—then any externally threaded part passed by any ring will assemble with any tapped hole passed by the plug gage.

For simple cylindrical fits the plug and ring gages must themselves be truly cylindrical and must be a closer fit with each other than with the work which is gaged and passed as satisfactory. This is evidently so, for if a thousandth or so of looseness is permitted between a cylindrical plug and ring gage, an external diameter may be passed by the ring gage which is too large to enter a hole passed by the plug gage.

Threads Require Exact Fits

For threaded fits the requirement for simple interchangeability becomes more exacting. The plug and ring gages must not merely fit into each other closely as judged by "feel" when fully engaged, but they must fit in lead and in form as well. This is for the same reason as applies to the simpler requirements for a cylindrical fit: namely, that any area existing as a *clearance* between external and internal gages becomes a permission for *interference* between the internal and external threads being gaged.

These are elementary principles, introduced at this point to show the complexity of screw-thread fits, which involve questions of form and lead errors in even the simplest problems. In spite of this fact, probably 90 per cent of screw-thread inspection is based on diameter measurements alone.

Another important point is that the gages must be inspected after being used for a time to make sure that plugs and rings originally satisfactory do not wear to such an extent that the ring gage will pass too large a bolt, and the plug gage too small a hole, to permit assembly. This is best done by setting a theoretically "basic" thread size. When the ring gage wears above this, or the plug gage wears below it, they are discarded. This use of the "basic" size as the boundary or "dead line" between the external and internal threads is the essential element of the unilateral system of tolerances, on which the American Standard is based.

To sum up, simple "go" gages of suitable form and lead accuracy will insure interchangeability, until they wear to dimensions on the wrong side of the theoretical "basic" size.

Suitable Functioning in Use. This is obviously a step beyond mere interchangeability. The fact that a nut can be assembled on a bolt does not

give assurance that we have a good nut and bolt for practical purposes.

As a first requirement the fit must not be so loose that the threads will shear off, or distort and pull through. It should be remembered, however, that this is not likely to occur with any degree of looseness of fit met with in ordinary practice. The resistance of the threads to shearing or distortion in a standard nut is so much greater than the tensile strength of the bolt that the latter ordinarily fails at the minor diameter of the thread.

In most cases where the failure has apparently occurred on the threads, a critical examination shows that the real cause lies in the elongation of the bolt preliminary to fracture. The threads on the elongated portion have an increased lead, and as the tightening of the nut draws this deformed thread into engagement, it sets up a progressive shearing action of the mating threads. A primary failure of the bolt in tension is thus given the false appearance of a failure of the threads by shear or distortion.

It is common to assert that a coarse pitch thread is stronger against shear than a fine pitch thread. This is not true, as a glance at Figure 1 will show. There is the same total area to be sheared in either case, if the action takes place along line $x-x$. If the action takes place at the minor diameter $y-y$, as it normally should, the fine pitch thread is actually stronger, since the diameter of the cylinder sheared is larger and the area sheared correspondingly greater; and, of course, the tensile strength of the bolt is greater also.

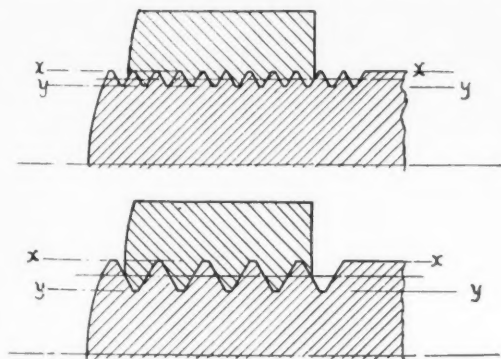


Fig. 1

It is true that a given amount of looseness decreases the shearing strength to a greater extent in the finer pitch. This is shown exaggerated in Figure 2, where the same looseness produces approximately at 25 per cent reduction in shearing strength in the coarse pitch thread, but a 50 per cent reduction in the fine pitch. From this standpoint, pitch diameter tolerances should vary with the pitch.

These facts have been recognized in the new

Screw Thread Chairman



Courtesy of Mechanical Engineering

Ralph E. Flanders, A.S.M.E. President and President of Jones & Lamson Machine Company, who steered the work of the Screw Thread Sectional Committee through many difficult sessions as Chairman.

For the past 16 years he has served on committees devoted to this work, which was only a part of his many activities on fundamental engineering problems.

report in the development and inclusion of dimensions and tolerances for the 8-pitch, 12-pitch, and 16-pitch thread series to larger diameters with appropriate tolerances. The 8-pitch thread

Railroad Urges Wide Use Of Screw Thread Standard

In the interest of economy and elimination of misunderstanding and confusion, this screw thread standard should be universally adopted by both manufacturers and users.

Such procedure would be a decided step in the right direction and would encourage the development of other universal standards. — *New York Central System.*

in particular is suited to the heaviest service that bolts, studs, and nuts can be called on to bear.

Service requirements set a limit on tightness of engagement as well as on looseness. In assembly

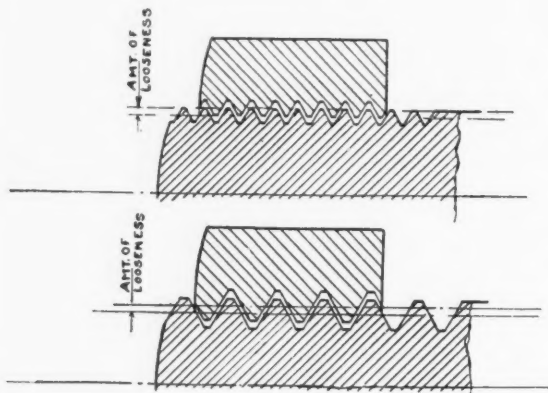


Fig. 2

operations of mass production it is ordinarily required that the nuts fit freely enough to be spun on by hand. This sets limits not only on pitch diameter, but on lead and form.

In some thread systems free assembly of threaded parts is assured by providing a "neutral zone" or allowance between the largest bolt and the smallest nut. This allowance is necessary in special cases, as occurs in ordnance work, for instance, where screw threads must be hastily assembled in the field in the presence of dust and mud. In ordinary shop conditions, if the go gages of accurate form and lead are not allowed to wear to the point where they freely screw into each other, a virtual allowance is obtained in practice, even when it is not specifically provided; for the workman will set his tools to allow for

some wear before coming down to close fit on the gage. This natural allowance by the workman produces a virtual allowance in the work.

There are other cases calling for "force fits" or "wrench fits," in which an initial tightness between threaded part and tapped hole is demanded instead of avoided. Examples are fits for cylinder studs and for railroad track bolts. Work must be held to much closer limits for such fits than for the ordinary cases where looseness is required rather than tightness.

Three Ways for Tightness

The required tightness can be obtained in three ways: by distortion through a difference in lead of bolt and nut; by distortion through a difference in thread shape in bolt and nut; or by compression of materials in threads of accurate shape, but with sufficient difference in pitch diameter to give the required interference.

Difference in lead has been used in track bolts in this country to a considerable extent. Any fit which depends on distortion, however, is likely to loosen if screwed and unscrewed several times. Difference in lead is particularly unsafe for studs screwed into iron castings, as the threads in the brittle cast iron are liable to fracture by progressive shear. If the lead of the stud is long, it will raise the metal about the tapped hole when screwed into such semi-ductile materials as aluminum alloys.

A purposive difference in thread shapes is also employed, a number of thread forms for this purpose having been patented. The use of U. S. S. bolts with Whitworth nuts, and *vice versa*, has also been suggested. This localizes the distortion and would seem to be preferable to the use of varying lead; but the objection that repeated screwing and unscrewing of the fit loosens it still holds.

The generally adopted solution requires that the mating threads be alike in lead and shape, and that the fit be obtained by making the pitch diameter of the bolt or stud larger than that of the nut or tapped hole. This makes the most permanent fit, but requires the most accurate pitch diameter control.

Form Accuracy Important

As a matter of fact, most wrench fits are obtained by a combination of these methods in varying proportions, depending on the lead and form accuracy of the threads. Form accuracy in particular is of prime importance. The danger of getting a false or insufficient bearing on the threads is very great. Figure 3 shows a case where the tightness of fit would be apparently sufficient.

but would not last under continued strain and vibration.

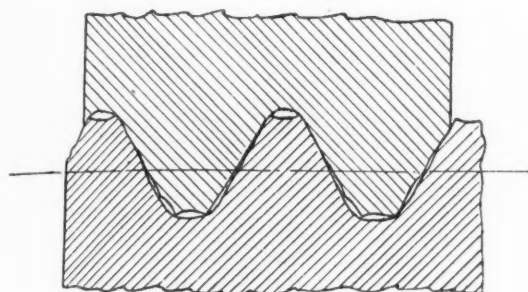


Fig. 3

This brings us to the importance of standards for the lead, form and finish required for permanence of fit. Figure 4 shows a bracket bolted to a machine frame and carrying a shaft bearing. Care will be taken to machine to a smooth, accurate surface the pad on the bed and the face of the bracket which is clamped against it. This is necessary for accuracy of location, and for permanence of location as well. If the parts were

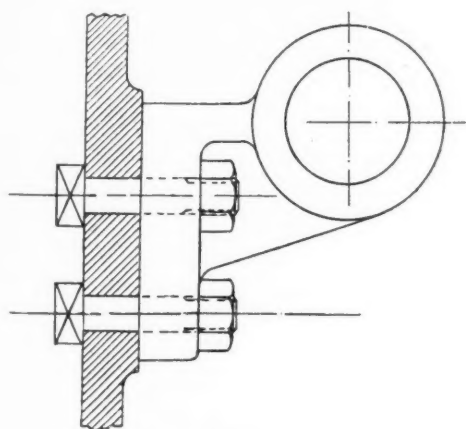


Fig. 4

clamped together on rough cast surfaces, continued vibration would bed the high points of each into the other, loosening the fit and disturbing the alignment.

Now, while the necessity for proper machining of the clamped surfaces has always been recognized, the importance of the other half of the fit has not been, though it is subjected to far higher unit pressures. The bracket is held against the bed by the fit on the screw thread between the

Standard Screw Threads Simplify Manufacturing

The adoption of standard screw threads by the General Electric Company has greatly simplified our problems of manufacture and assembly.

It has also materially simplified the work in our design and drafting departments, and of course has reduced the investment in inventory of these items.

Perhaps one of the greatest advantages is the assurance of satisfactory fits regardless of the source of supply when ordered to these standards.—*General Electric Company.*

bolts and the nuts. If the threads on the nuts happens to look like that shown in Figure 5 (which is an enlarged projection from actual practice), the nut may be tightened up sufficiently in the original assembly, but continued strain and vibration will seat the irregular surfaces into each other and thus loosen the fit,—perhaps dangerously.

This condition may be readily observed in automobile assembly when the engine, with all threaded fits properly drawn up, is "run in" slowly, and then at full speed, for a suitable length of time. At the conclusion of the run the crank and connecting rod bearings are found loose and the nuts are tightened. This used to be called "taking up the bearings," and it was usually assumed that the bearings themselves had "worn in" to that extent.

This is now generally recognized as a false assumption, as is proved by observing the number of degrees the nuts require to be turned to restore them to the desired tightness. If the amount of

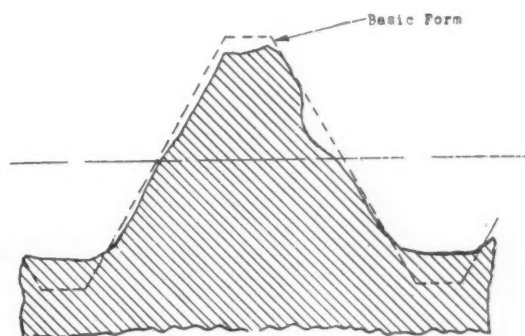


Fig. 5

Westinghouse Finds Savings in Standards

The adoption of standard screw threads and fits has benefitted the industry through a reduction in number of diameters and threads, and has reduced assembly trouble in manufacturing due to the establishment of definite thread fits.

Savings have been effected in purchasing taps and dies.

This has been made possible by standardization which enables the tap and die manufacturers to make and stock a commercial line, which when produced in quantity enables tap and die manufacturers to produce better thread fits.—*Westinghouse Electric & Manufacturing Company.*

axial movement be calculated from this angle and from the pitch of the thread, it will be found so great that if this amount were worn off the bearing the accuracy of its surface would be completely destroyed. What has really happened is that defective thread surfaces in bolts, studs, nuts, and tapped holes have bedded into each other, producing the observed looseness. To be permanent and reliable in service, the lead and form of screw threads must be accurately controlled.

Needs Clearance at Diameters

One point which must be emphasized in this respect is the necessity for clearance at both major and minor diameter of the screw thread. Only if this clearance is great enough to be practically infallible can we be sure that the apparent fit is being obtained on the flanks of the thread where it belongs, instead of on some false bearing at the crest or root. This false bearing leads to unreliability in service, and is particularly likely to occur from the rapid wear of the points of threading tools if sufficient clearance is not originally provided.

One case of this sort which has come to the writer's attention is in the practice of a very important electrical works, where copper nuts and threaded ends were required to transmit large electric currents through the threaded fit. With the purpose of getting more conductive area the electrical engineers specified that the screw threads should fit on the top and bottom as well

as on the sides. The first wear of tap and chaser points increased the bearing on the points and lessened it on the more important flank contacts. As a consequence, the current-carrying capacity of the thread was actually diminished. The provision of an initial clearance at the crest and root at once brought conditions back to a satisfactory capacity. All of these considerations explain the importance given in the Report to factors other than pitch diameter.

Psychology Plays a Part

There is a final factor which sets a limit to the amount of looseness permitted in a fit which hardly comes under the classification of "proper functioning in service," since it is purely psychological. It is, nevertheless, an effective factor.

During the writer's service on the National Screw Thread Commission and on the sectional committee of the American Standards Association, samples of bolts and nuts were made up in different sizes to the loosest conditions of the Class 1 Fit of the American Standard. They were made accurate as to lead and form.

Now, these nut and bolt threads were strong enough to break the bolt in tension, and were capable of satisfactory service wherever an actual metal-to-metal fit on the threads was not required; but of the many men who examined them, none was enthusiastic. No bolt-and-nut maker wanted to admit that his product was as loose as that. No machine builder wanted to incorporate it into his product. No machine purchaser would care to accept it as a satisfactory element of a machine for his own use.

This factor is a real one, and must have practical consideration.

Economical Production. Screw thread standards must be so set as to permit interchangeability, assure satisfactory service, and, finally, to permit economical production.

At first sight the requirements of economical production seem at variance with the rigid limits set by standardization. For instance, many parts will be discarded as spoiled which could be saved by making corresponding changes in dimensions of the mating parts.

In less serious cases, re-machining of defective parts could be obviated by selective assembly; as, for instance, finding a nut near the upper limit of pitch diameter to use with a bolt which is a little too large to enter the "go" gage.

These expedients *seem* to be more in line with economical manufacture than would a strict adherence to standards, with its insistence on an added salvaging operation in the one case, or a complete scrapping of the part in the other. But this view is a short-sighted one. In the long view, standardization would be required for cheapness

of production alone, even though it did not affect the quality of the finished product.

In the first place, interchangeability (which standardization assures) is more than a convenience to the manufacturer and user of a product. It reduces the cost of manufacture directly. Without it the cost of fitting and assembling a complete machine is likely to be greater than the cost of producing its separate parts. This is especially true when the components are made in different factories at different times.

In the second place, standardization, and especially thread standardization, is the necessary requirement for the provision of high grade and productive cutting tools at a reasonable cost. It is only when thread dimensions are completely determined, and the disrupting effect of special dimensions largely removed, that the manufacture of the highest grade of taps and die-head chasers becomes possible on a large scale and at a reasonable cost. In the present state of the art this means, for most threaded work, taps and chasers of high-speed steel with the thread forms ground to accurate shape after hardening. Such tools produce better threads at less cost per part manufactured, and are only possible at a commercial price after definite standards have been set.

Experience shows beyond any doubt that the cheapest way to obtain threaded products which will meet definite functional requirements is to make those products to proper standards.

Details of Standardization

To be effective, the principles which have just been discussed require to be embodied in definite standards. The standard approved by the American Standards Association incorporates the following elements:

Major Diameter. The major diameter must be such that there is clearance between the crest of the bolt thread and the nut. This clearance must be great enough to permit a reasonable wear on the crests of the tap teeth before the hole refuses a basic thread gage and the tap is discarded.

Minor Diameter. There must be a definite clearance at the minor diameter for the same reasons that it is provided at the major diameter. This clearance may be large, and may be provided by a large tap drill. The shearing strain of the bolt and nut is not diminished, and the depth of engagement is sufficient with any ordinary pitch diameter tolerances.

If the minor diameter of the bolt is permitted to increase to a point short of interference with the minimum tap drill size, the tensile strength of the bolt is increased thereby.

Tooth Form. The form must be accurate within definite limits to preserve a useful pitch diam-

Best Product, Lowest Price

The standardization of screw threads is desirable from the standpoints of interchangeability, proper functioning, and cheapness of production.

Suitable standards have been set by the authorized standardization bodies of several leading industrial nations.

This latest revision of our own standard is based on a decade of wide practical use during which the theoretical considerations have been subjected to test and modification.

Improved thread-cutting tools and means for gaging are now available, which bring any reasonable standard into the class of cheap production.

Standardization thus reaches its goal—"The best product at the lowest price."

eter tolerance. Similarly, the shapes must be closely held so that the flanks of the mating threads bear broadly on each other. This prevents the loosening of the fit which occurs where badly shaped threads bed into each other under pressure and vibration.

In addition, as previously described, accurate lead is required for strength, to avoid distortion of members, and to make fits which are durable under pressure and vibration.

Pitch Diameter. From the foregoing paragraphs it is evident that pitch diameter is only one of the elements entering into the production of a given fit. Lead and form and pitch diameter are each elements in a cumulative effect. This cumulative effect is indicated in the tables by giving the amount of lead and of angle error which will absorb one-half of the pitch diameter tolerance.

Finish. It is highly desirable, but practically difficult, to set standards of finish. Rough and scored surfaces offer the most dangerous conditions as to loosening of the fit under pressure and vibration. Extremely rough surfaces should not be permitted.

In the same category come other defects, such as "drunken threads" on bolts and screws, due to being threaded with a die whose axis was not true with the axis of rotation of the work.

Tapered threads must not be allowed if the

(Please turn to Page 261)

Wool Industry is Taking Steps to Protect Ultimate Consumers; Labeling Group Named

BECAUSE the consumers of today are rapidly demanding factual knowledge regarding merchandise, it becomes increasingly important for manufacturers to tell their story over the counter.

Such data is of particular interest to women consumers, who are being educated by women's clubs, home economics and other groups, to demand specific information regarding merchandise under consideration for purchase. Unless this information is voluntarily made available to women, by manufacturers and retailers at the point of sale, the merchants' hands may be forced.

Careful labeling or tagging of merchandise, with facts presented—preferably on the basis of laboratory findings—is the safe way to assure accuracy of presentation. Apart from the fiber content of fabrics and merchandise, the problem of washability, cleanability, shrinkage, etc., is a very important element in the satisfaction which the customer gets out of purchases made.

In this connection Associated Wool Industries has already established contacts on behalf of wool with the National Association of Laundry Owners and The Dry Cleaners Institute to discover the most suitable methods for handling fabrics of wool.

The National Association of Wool Manufacturers has taken several important steps to protect the consumer of wool products.

At the instance of Mr. Arthur Besse, president, a Labeling Committee was appointed last year to propose and approve certain standards for fabrics of camel's hair and for wool piece goods when 100 per cent wool or when containing a certain amount of cotton, silk, rayon or other fibers.

Regulations for the labeling of knitted or woven fabrics containing camel's hair or other specialty fibers were adopted by the board of directors in February, 1935.

On May 16, 1935, regulations for the labeling of wool and part wool knitted or woven fabrics were approved and adopted.

Prior to this, standard percentages of wool content in blankets had also been defined. These standards are found in United States Department of Commerce, Bureau of Standards, Commercial Standard CS39-32.

The American Standards Association has organ-

¹Excerpts from address by Ernest C. Morse, General Director, Associated Wool Industries, at convention of National Retail Dry Goods Association, June.

Paint Specifications Help Bidders Quote

The advantage of a specification properly drawn is that it states clearly the minimum requirements for the material in question, so that all bidders can quote on the same minimum quality and kind of material. It furnishes the buyer directions for testing, so that any one with adequate knowledge and equipment can learn from an examination of the delivered material whether it does or does not meet the requirements.—*P. H. Walker, Acting Chief, Chemistry Division, National Bureau of Standards, Washington, D. C., in A.S.T.M. Symposium on Paint and Paint Materials.*

ized a Committee on Ultimate Consumer Goods and also a textile committee was authorized at a recent meeting of the American Standards Association Standards Council in April. It will enlist the active cooperation of the groups concerned; help to plan programs in such a way as to make the most effective use of means available; and facilitate the selection and setting up of a few very carefully chosen projects to start the work.

Probably no single factor is more important in connection with efforts to protect the consumer than proper labeling or tagging of merchandise. The consumer is seeking information, and there is no safer way to assure her that she is getting her money's worth than through facts at the point of sale.

Standards Used On French Ships

The French Ministry of Merchant Marine has set up a committee to put into effect on ships under construction the standard specifications for shipbuilding approved by the Standardization Committee of the Ministry. Members of the new committee include representatives of the Bureau Veritas, the French national standardizing body, various shipping and shipbuilding companies, and the French Shipbuilders' Association.

Building Code Committee is Named; Will Head Up Nation-Wide Project

**Correlating Committees to Appoint Numerous
Technical Groups to Make Specific Studies and
Reports.**

**Code to Serve Municipalities in Writing Build-
ing Regulations.**

**National Bureau of Standards Will Cooperate,
and Industry Will Play Important Role in Code.**

SIXTEEN national technical associations, construction and fire protection organizations, and governmental agencies have named representatives to serve on the American Standards Association's building code correlating committee. It will meet September 17, 1935, in New York to organize. It is expected that three more groups will appoint representatives.

This committee will appoint several technical committees, which will report on the many problems involved in developing a national building code. This work will serve to guide states, municipalities, and federal departments in writing their own building regulations. Several technical committees are already handling work in the building code field under the auspices of the ASA.

The committee will continue the development of standards applicable to building codes started in 1921 by the Department of Commerce Building Code Committee, discontinued early in 1934 due to reduction in expenditures for the ordinary activity of the Department of Commerce. Industry will accept an increased share of the burden for those projects in which it is vitally interested, the representation indicates. The National Bureau of Standards will continue an active interest in the field of building code regulation and will maintain close cooperation with the ASA project.

The new ASA Building Code Correlating Committee will consider matters of general interest with respect to building codes:

- to act as advisory committee to the Association;
- to consider what subjects are appropriate for development in the ASA;

- to define and limit the scope of projects for which it recommends sponsors;
- to follow up work in progress in the development of projects;

- to review the personnel of committees responsible for building code projects to insure their having a representative character;
- to examine recommendations submitted by sectional committees and to harmonize conflicts between the several recommendations;
- and

- to act upon such other matters that may be brought before it with relation to the development of building codes as it may consider within its province.

Other Committees to be Formed

Individual projects will be handled by sectional or technical committees, thus affording representation for all those having an interest in one or more phases of building codes, but not in the entire field. The organization of specific sectional committees will result from the recommendations of the correlating committee.

The breakdown of the component parts of a building code under a coordinated plan has definite technical advantages. It permits use of standards in existence that logically fit into the pattern. Development of the most immediately desirable subjects can take place without waiting for the last word on other subjects of lesser importance, or which require extended investigation before requirements for them can be developed.

With a flexible pattern set up, standards for

Wide Representation Named On Building Code Committee

The American Standards Association Building Code Correlating Committee, appointed by their respective organizations, will meet on September 17, 1935, in New York to launch the task turned over to the ASA by the Department of Commerce.

The personnel follows:

American Institute of Architects, *J. Andre Fouilhoux, H. R. Dowsell, alternate*
 American Municipal Association, *Wm. P. Capes, A. H. Hall, alternate*
 American Public Health Association, *A. E. Gorman, W. Scott Johnson, alternate*
 American Society of Civil Engineers, *R. P. Miller, Melvin S. Rich, alternate*
 American Society for Testing Materials, *R. P. Miller, R. E. Hess, alternate*
 Associated General Contractors of America, *W. F. Austin, Daniel T. Webster, alternate*
 Building Officials' Conference, *Edward W. Roemer, Frank C. Keller, alternate*
 Forest Products Laboratory, U. S. Dept. of Agriculture, *J. A. Newlin, L. J. Markwardt, alternate*
 International Assn. of Governmental Labor Officials, *Representative not yet appointed*
 National Association of Building Owners & Managers, *Representative not yet appointed*
 National Association of Builders' Exchange, *Representative not yet appointed*
 National Association of Real Estate Boards, *H. U. Nelson*
 National Board of Fire Underwriters, *W. E. Mal-lieu, C. T. Bissell, alternate*
 National Bureau of Standards, U. S. Department of Commerce, *George Thompson, Vincent B. Phelan, alternate*
 National Fire Protection Association, *Representative not yet appointed*
 National Safety Council, *W. Dean Keefer, alternate*
 Pacific Coast Building Officials' Conference, *David H. Merrill, Walter Putnam, alternate*
 Procurement Division, U. S. Treasury Department, *C. W. Chamberlain, H. H. Maples, alternate*
 Public Health Service, U. S. Treasury Dept., *R. R. Sayers, Rollo H. Britten, alternate*
 Federal Housing Administration, *Miles L. Colean*

new types of construction or new materials can be easily and quickly added to it as they are brought out. Another important feature is that the main structure can be made brief or elaborate in line with needs of small municipalities as compared with larger ones, or easily changed as regional variations become necessary.

For years, architects, engineers, builders, manufacturers, and others whose work or products go into building construction have complained bitterly about existing building regulations. Architects have said that their freedom of design has been unnecessarily restricted. Engineers and builders have claimed that obsolete or ill-considered code provisions increased building construction costs without adding any compensating benefits in the way of increased public safety or health. Manufacturers of building materials have repeatedly pointed out that their tested and tried products have been compelled to run a gauntlet of conflicting regulations, and that promising new materials and methods sometimes died in the struggle for recognition.

The public, on the other hand, has voiced its disapproval of poor or uncontrolled construction in no uncertain terms following the destruction wrought by earthquakes, tornadoes, fire, time, and other causes. In addition, those who advance money on building construction, those who insure building loans, and those who insure buildings demand sound building regulations as a protection for their investment.

When questions of public health and safety, requirements for countless varieties of building materials, and design and construction problems are blended together to form a building code, it is obvious that the blending process must be done fairly and concisely. Everyone is entitled to his day in court. Such a premise requires a broad range of representation and a permanent, long-range plan for insuring retention of advances made, as well as providing machinery for necessary revisions.

Many Codes are Obsolete

Some experts particularly familiar with the building code situation in this country have said that any building code over ten years old needs revision. With this as a criterion some 642 of the 1,630 building codes reported by the National Bureau of Standards¹ as being in existence should be revised if they are to give the public the benefit of decreased building costs due to more efficient use of building materials or to new developments in construction which have been developed within the past decade.

If this basis for revision were extended to include those codes over fifty years old, and in all probability some sections of codes of that age could well stand revision, some 620 additional codes could be added to those which might profitably be revised.

There are now several state building codes, including those in Indiana, Nebraska, Ohio, and

¹Circular 377, National Bureau of Standards, Washington, D. C.

Wisconsin. In some cases these state codes are mandatory, while in others they are purely advisory.

In addition to these rather complete codes, Florida has requirements dealing with hotels and apartments, California and many other states have requirements applying to school building construction and several states have tenement or housing laws covering the construction of all dwellings above the detached or semi-detached dwelling.

Prize Paper Says Standards Cut Cost of Electric Distribution

Standardization was one of the methods suggested in the Second Prize paper chosen by *Electrical West* as an answer to its contest question "How Can the Cost of Electric Distribution Be Lowered?"

Company standards for material purchased and periodic checking of purchases to be certain that they comply with the company's standards would reduce the number of small leaks which cost the company money, in the opinion of F. S. Benson, Assistant Electrical Engineer, Pacific Gas and Electric Company, San Francisco, one of the winners of the Second Prize.

"The Operating Department should construct all lines and install all material and equipment as instructed by the company's standards," Mr. Benson says. "Individual representatives of this department should not be encouraged to install or construct distribution facilities with material or equipment that is not standard. A rigid engineering design should be followed in all cases and all facilities installed in all parts of the system should have similar construction. Rugged individualism has no place if low cost distribution facilities are demanded."

ASA Approves Method of Marking Combinations of Gold and Silver

The Commercial Standard for Marking Articles Made of Silver in Combination with Gold, CS51-35, submitted to the American Standards Association by the National Bureau of Standards, has been approved as American Recommended Practice by the ASA Standards Council.

The standard provides, among other things, that an article in which the parts made of the two metals are combined so as not to be easily distinguished may carry a quality mark consisting of the words "Sterling and" or "Sterling +" followed by a fraction representing the proportion of the weight of the alloyed gold to the weight of the metal in the article, and a karat mark representing the actual karat fineness of the gold.

ASA Has Been Working On Construction Projects

Although the American Standards Association has not heretofore considered building code regulations in their entirety, it has approved or has under way projects which play an important part in building regulation.

Some of these projects form a complete chapter of a building code. Among this type are:

Building Exits Code—sponsored by the National Fire Prevention Association.

Safety Code for Elevators, Dumbwaiters, and Escalators—sponsored by American Institute of Architects, American Society of Mechanical Engineers, and National Bureau of Standards.

National Electrical Code—sponsored by the National Fire Protection Association.

Safety in the Construction Industry—sponsored by the American Institute of Architects and the National Safety Council.

National Electrical Safety Code—sponsored by the National Bureau of Standards.

Other standards for materials, appliances, and safety requirements might be added to the above list.

American Welding Society Revises Welding Codes

Revisions in its Codes for Fusion Welding and Gas Cutting in Building Construction and for Resistance Welding of Structural Steel in Building Construction have been approved by the American Welding Society.

The allowable working stresses for resistance welding of structural steel coincide with those specified for fusion welding. A minimum factor of safety of 3 is required for the weakest member or joint of any product manufactured by resistance welding machines.

Manual of Standards Lists American Standards

Reprints of the Manual of Standards, published in the August issue of *INDUSTRIAL STANDARDIZATION*, are now available from the American Standards Association. The Manual is an indexed list of all standards approved by the American Standards Association which are in print. It may be had, gratis, from the ASA office. The price of each standard is given in the Manual.

New School Buildings Meet the American Standard Lighting Provisions, Report Says

Only in new school buildings erected during the last few years is the lighting of classrooms up to the standards provided in the American Standard for School Lighting, according to a report prepared by the Illumination Committee of the United States for the 1935 convention of the International Commission on Illumination. The general level of illumination found today in class and study rooms is from 5 to 10 footcandles, whereas the standards recommended are 8 to 12 footcandles for class rooms and gymnasiums, and 10 to 15 footcandles for sewing, drafting, and art rooms.

The report says in part:

"School rooms are classified in four ways according to the severity of the visual tasks demanded. For the illumination value, a range is given in order to take into account the proportion of time in which the room is used under artificial lighting, this proportion varying with latitude, prevailing sky brightness, and interference from buildings and trees.

"The 1931 edition of the Statistical Abstract of the United States shows that during the ten months of the school year, the percentage of possible sunshine throughout the 48 states amounts to only 53 per cent. This clearly indicates that, even when natural lighting is used to its practical limit through the school day, artificial illumination is necessary more than 40 per cent of the time to provide adequate seeing conditions. . . .

Less Funds, But Better Light

"The economic depression created a reduction in school funds. Nevertheless, the past three years have shown a rapidly growing appreciation on the part of architects and school authorities of the value of new school lighting standards, and especially of the economic value of the recommended higher levels of illumination."

The American Standards of School Lighting referred to in the report were prepared by a committee working under the procedure of the American Standards Association, and under the direction of the Illuminating Engineering Society and the American Institute of Architects. On the committee were represented, among others, the American Medical Association, the American Public Health Association, Eyesight Conservation Council, the National Association of Public School Business Officials, the National Council on Schoolhouse Construction, the National Education Asso-

ciation, as well as the Office of Education of the U. S. Department of the Interior, the Women's Bureau of the U. S. Department of Labor, the National Bureau of Standards, and other organizations interested in lighting, public health, and prevention of blindness.

Safety Equipment Exhibited By Chinese Inspection Bureau

In order that factories in China, where the importance of safety and sanitation are beginning to be appreciated, may see how machinery can be guarded and how factories can be kept in a sanitary condition, the National Factory Inspection Bureau of the Ministry of Industry, Nanking, is arranging an Industrial Safety and Hygiene Exhibition at Nanking to be held soon. All Chinese factories are inspected now in accordance with the Factory Law, and both employers and employees are beginning to appreciate the value of safety and hygiene, according to an announcement of the proposed Exhibition from the Director of the Bureau, received through the International Labour Office.

Australian Hospitals Will Use Standard Beds

A standard for hospital beds was adopted recently by the Standards Association of Australia, covering the essential basic requirements of ward beds of a nominal width of three feet.

Dimensions and general construction of the head-end, foot-end and mattress bottom, and clauses dealing with tubing, mattress frame, mattress mesh, springs, castors, chills, and finish, are included in the standard.

A.S.T.M. Committee Proposes To Revise Test for Textiles

The committee on Textile Materials, D-13, of the American Society for Testing Materials has suggested to the A.S.T.M. a proposed revision in the elongation test contained in the Standard General Methods of Testing Woven Textile Materials (A.S.T.M. D39-34). This A.S.T.M. standard was approved as American Standard (L5-1934) by the American Standards Association.

Wider Use of Educational Films Is Stake in World 16mm Standard

AN international standard for uniformity of 16mm sound motion picture film and projectors has been asked of the International Standards Association by the American Standards Association. Delegates from many interested nations met July 7 to 13 in Paris, to work out an agreement on several disputed points upon which hinges a million-dollar export market.

The American standard, developed through the efforts of the Society of Motion Picture Engineers, puts the sound track on the left of the film, whereas the subsequent German proposal calls for the sound track to be on the right. European practice is considerably divided, some producers using the German method and others the American.

The increasing use of the 16mm sound films in schools, by technologists, in sales promotion work, and for general cultural and entertainment purposes makes a world standard imperative, American spokesmen at the conference pointed out.

Advantages to Europeans

Many advantages would accrue to European producers through an international standard. The rich cultural and historical background of the European nations would offer many subjects of interest to Americans, could the European films be used readily in schools and homes in this country. Without an international standard, two or more projectors would have to be used or special films printed. Such complications would block importation of foreign films to a great extent.

Conversely, uniformity would open the European market for more U.S.-made film. Great strides have been made in the 16mm sound field in this country.

A referendum of all interested nations will be taken by letter ballot by the International Standards Association. Among the questions which are expected to appear on the ballot are:

1. Should a single standard for 16mm sound film be adopted by the entire world with the least possible delay?
2. Where should the sound track be?
3. What should the distance be between the

sound and the corresponding picture? (American practice calls for 25 frames, or pictures, in the lead of the film prior to the start of the sound. Some Europeans favor 28, others 27. France is divided on this point, there being no national standard.)

4. Should the emulsion on the film be toward the lens or toward the light source? (Here the thickness of the film tends to distort the sound unless some standard practice is adopted. Otherwise a device to refocus the sound objective must be used.)

ISA Keeps Project

American and German delegates to the congress won an important point in keeping the 16mm film standard project under the jurisdiction of the International Standards Association, instead of referring it to the next International Congress of Scientific and Applied Photography. Later this was made unanimous, when the photography group adopted the proposal for an international canvass.

Although the questions involved will not be settled for several months, those interested in world standards expressed delight that the matter had been placed in the hands of the International Standards Association, long-established and successful agency for bringing about world agreement in standardization. The American Standards Association is one of the nineteen members of the ISA.

Statistics Have Bearing

Data showing the number of projectors now in use in the United States, Germany, France, Italy, Great Britain, and other countries will be compiled to throw light on the general use of the several divergent practices. Germany claims as many projectors as does the United States, which estimates that there are today some 2,000 to 3,000 16mm sound projectors in use.

Some countries, such as Germany, Italy, and Russia use 76mm films extensively in educational work. This use has been accelerated in the United States during recent years.

Industry Requires Standards For Customers' Gas Equipment

From its inception the gas industry has functioned in all of its activities according to specifications and standards. Most of them, relating to quality of service, were originally self-imposed and later incorporated into the requirements of the regulatory bodies as they were organized. Instruments of precision and their exact operation have been known and used by generations of gas operators and include among others the wet and dry meters, photometers, and calorimeters.

The industry is so firm a believer in the use of standards and specifications in connection with its raw materials and ultimate product that it also requires their use for the utilization equipment it sells to its customers.

Many of the larger companies maintain utilization laboratories and the industry supports a central testing laboratory. Appliances, principally domestic at present, which bear the approval seal of the American Gas Association, must have complied with comprehensive specifications of construction and performance, the latter particularly with regard to safety and economy. The assistance of representative national organizations, including interested governmental agencies, is had in preparation of the specifications, all in accordance with the established procedure of the American Standards Association.—*George B. Cortelyou, in the American Gas Association Monthly.*

Proposal for Simplification On Brushes Mailed to Industry

A proposed Simplified Practice Recommendation for counter, window, and radiator brushes was mailed recently by the Division of Simplified Practice, National Bureau of Standards, to manufacturers, distributors, and users for their consideration and approval.

This recommendation, which was proposed by the American Brush Manufacturers Association,

establishes a simplified list of standard stock varieties of counter, window, and radiator brushes.

The recommendation, if approved by the industry, will be issued as a Simplified Practice Recommendation and will be effective from a date which will be announced later by the National Bureau of Standards.

Standards Reduce Manufacturing Costs

Standardization should not, of course, be adopted simply for the sake of the principle when there is no real need for it, but there can be no question of the advantages to be gained from the adoption of standard and interchangeable plant and products. The manufacturing costs are reduced, the capital idle is decreased due to fewer patterns and so forth, stocks do not become obsolete so readily, second-hand goods are of more value when certain of their parts can be fitted to other manufacturers' goods, the product is more reliable and of better price, delivery is quicker, the cost of preparing drawings and estimates is decreased materially and with less risk of errors.—*Chemical Age, London, Feb. 9, 1935.*

Tests for Insulating Oils Proposed for Revision

The American Standard Methods of Testing Electrical Insulating Oils (C59.2-1935) are being placed under revision, according to a notice received by the American Standards Association from the American Society for Testing Materials, sponsor for the project on Electrical Insulating Materials (C59).

The revisions, which A.S.T.M. Committee D-9 has proposed for publication as tentative, are given in detail in the annual report of this committee. Copies of the report can be obtained from the offices of the American Society for Testing Materials, 260 South Broad Street, Philadelphia, or from the American Standards Association.

Workers Protected in British Coal Tar Sampling Standard

The British Standards Institution recently approved a Standard Specification for the Sampling of Coal Tar and its products, a copy of which is now in the ASA office. The specification gives full details of the apparatus to be used, including diagrams, methods of preparing samples of different types of products, and sets up several precautions for workers and methods for preventing contamination of samples.

Domestic Water Heater Standards Are Modernized by Gas Association

Revised requirements developed by the American Gas Association and approved by the ASA specify higher efficiencies in burners

by

H. W. Smith, Jr.

*American Gas Association
Testing Laboratories*

IN the formulation and application of national standards, keeping abreast of the times—being modern—is as important as in any other phase of industry's activity. Standards must be continually revised to keep pace with new trends, new demands, and new developments in the manu-

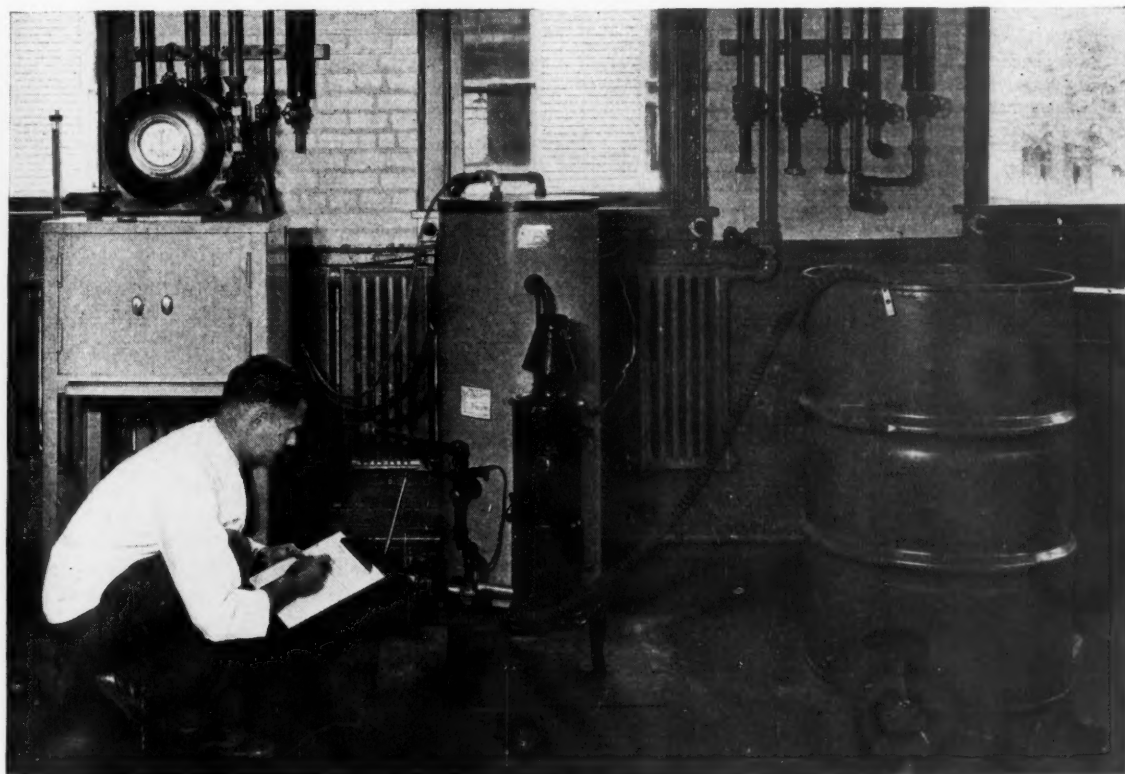
facture of goods. Otherwise those standards grow obsolete and hinder progress rather than accelerate it.

In the field of domestic gas water-heater manufacture, the American Gas Association, one of the most progressive Member-Bodies of the American Standards Association, has recently demonstrated the vigilant manner in which it continually operates to improve and extend its requirements cover-

Requires Higher Efficiencies

In the new American Standard Requirements for gas water heaters, a tested thermal efficiency of at least 70 per cent (5 per cent higher than the former standards) is specified.

A part of one of the testing rooms of the American Gas Association Testing Laboratories, Cleveland, is shown below.



Manufacturers and Consumers Help To Write Gas-Appliance Standards

Manufacturers, consumers' organizations, and insurance interests are represented on the sectional committee of the American Standards Association, which acts also as the Approval Requirements Committee of the American Gas Association, in charge of the requirements for gas-burning appliances. After the work of the committee on any gas appliance has resulted in agreement by a sufficient majority of the interests represented, and has been given approval by the American Gas Association, it is submitted to the American Standards Association, for approval as a national standard.

The organizations represented on the Sectional Committee on Approval and Installation Requirements for Gas-Burning Appliances are:

R. B. Harper, American Gas Association, *Chairman*

R. M. Conner, American Gas Association, *Secretary*

American Gas Association, Manufacturers Section, **C. S. Bagg**, **W. E. Derwent**, **B. B. Kahn**, **F. A. Lemke**, **H. W. O'Dowd**, **E. L. Payne**, **A. Stockstrom**

American Gas Association, Operating Companies, **E. L. Hall**, **R. B. Harper**, **W. S. Walker**, **H. E. G. Watson**, **L. B. Wilson**, **C. C. Winterstein**

American Home Economics Association, **Alice L. Edwards**

American Institute of Architects

Associated Factory Mutual Fire Insurance Companies, **A. L. Cobb**

Heating, Piping and Air Conditioning Contractors National Association, **Walter L. Fleischer**, **George P. Nachman** (*alt.*)

National Association of Master Plumbers of U. S., **J. L. Murphy**

National Safety Council, **Alice L. Edwards**, **Curtis Billings** (*alt.*)

U. S. Department of Agriculture, Bureau of Home Economics, **Dr. Louise Stanley**

U. S. Department of Commerce, National Bureau of Standards, **E. R. Weaver**

U. S. Department of Interior, Bureau of Mines, **W. P. Yant**

U. S. Treasury Department, Bureau of the Public Health Service, **Dr. R. R. Sayers**

years effected changes modernizing the American Standard Approval Requirements for Gas Water Heaters (Z21.10-1933). These revised standards were approved by the American Standards Association as of June 21, 1935.

The revised requirements become formally effective on and after January 1, 1936. After that date all gas water heaters approved by the American Gas Association and permitted, therefore, to bear the familiar blue star emblem, the Laboratory Seal of Approval, must be tested at the American Gas Association Laboratories in either Cleveland or Los Angeles in accordance with the new requirements. In brief, the revisions relate to the items discussed below.

Efficiency Is Increased

The most significant change is perhaps that which elevates the minimum corrected thermal efficiency required of water-heating equipment from 65 to 70 per cent. Little hardship is worked upon the manufacturer of appliances by this revision since modern perfections in design and construction render the attainment of a 70 per cent efficiency a relatively simple matter. In fact, more exacting demands on the part of users of gas, coupled with competitive forces, have long urged appliance builders in this direction. The net result, of course, is to raise the general level of water-heater manufacture.

In addition, the 1935 requirements are considerably more comprehensive than those of the 1933 set. Every effort has been made to correlate the approval requirements for water heaters with the various sets of listing requirements for gas-appliance accessories. For example, many of the clauses of the American Standard Listing Requirements for:

1. Gas Burner Valves,
 2. Draft Hoods,
 3. Relief and Automatic Gas Shut-Off Valves,
 4. Automatic Devices to Prevent Escape of Unburned Gas,
 5. Thermostats, and
 6. Pressure Regulators
- were inserted bodily into the revamped water-heater standards.

In other cases, where important requirements covering accessories were called for, although the listing standards as such were not suitable for the purpose, special stipulations were made so as to preclude any conflict between approval and listing specifications. Naturally, as a result of such endeavor, both the number and variety of requirements placed upon the various kinds of safety and control accessories supplied with approved water-heating equipment, have been appreciably increased.

ing the construction and performance of gas-burning equipment.

Through its Approval Requirements Committee (ASA Sectional Committee, Project Z21), the American Gas Association has in the past two

Protective Features Mandatory

As regards protective features, certain accessories heretofore merely recommended for use have been made mandatory. Means of preventing both the production of excessive water temperatures and pressures are now definitely required on all storage types of heaters. As a consequence, the American Gas Association Approval Requirements Committee (ASA Sectional Committee, Project Z21) has made certain rulings worthy of notation at this point. The requirement just mentioned would ordinarily only affect water heaters tested and approved after January 1, 1936.

However, the Approval Requirements Committee considers the matter of such importance that it feels that all water heaters bearing the Laboratory Seal of Approval which are offered for sale should, irrespective of date of approval, incorporate pressure and temperature relief or shut-off valves. It has, therefore, decreed that the requirement involved, Part I, Sec. 8, clause "a" of the new standards, be made retroactive on January 1 of next year. All water-heater manufacturers have been notified by mail of this action.

Correspondingly, the requirement which went into effect July 1, 1934, and which specified for the first time that all automatic water heaters be equipped with automatic devices to prevent escape of unburned gas (i.e., "safety pilots"), was made retroactive by the Approval Requirements Committee as of January 1, 1935. Hence, irrespective of the date of approval, certification will not now be continued upon any automatic storage gas water heater unless it is fitted with a satisfactory automatic device to prevent escape of unburned gas.

This illustrates the Association's position that, where considerations of safety or potential discrimination between competing manufacturers are involved, corrective rulings may be quickly made for immediate application, although it is not the policy of either the American Gas Association or its Testing Laboratories to make additional compliance demands upon manufacturers of approved appliances before the proper five-year interval between retests has elapsed.

International Labour Office Drafts Safety Code for Building Workers

A subcommittee of the Committee on Accident Prevention appointed by the International Labour Office in Geneva, Switzerland, has prepared a draft of proposed model regulations for the protection of building workers which will be submitted to the 1936 Session of the International Labour Conference. The draft will be considered by the Committee on Accident Prevention at its meeting on October 10-12 in Lucerne.

ASA Approves Standard Screw Threads for Hose Couplings

An American Standard covering hose coupling screw threads for all connections having nominal inside diameters of $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$ and 2 inches (B31.1-1935) was approved recently by the American Standards Association. It was developed by a sectional committee organized under ASA procedure and under the sponsorship of the American Society of Mechanical Engineers.

H. W. Bearce, chief, Division of Weights and Measures, National Bureau of Standards, Washington, D. C., is chairman of the committee, and A. L. Brown, director, Factory Mutual Laboratories, Associated Factory Mutual Fire Insurance Companies, Boston, Mass., is secretary.

Propose Changes in A.S.T.M. Tests For Wrought-Iron Plates and Bars

A proposed revision to Standard Specifications for Refined Wrought-Iron Bars (ASA G12-1931; A.S.T.M. A 41-30) and Standard Specifications for Wrought-Iron Plates (ASA G13-1931; A.S.T.M. A 42-34) has been recommended by A.S.T.M. Committee A-2 on Wrought Iron for publication by the Society.

The change in the specifications for wrought-iron bars includes a provision for procedure when a test specimen fails to meet the physical requirements of the standard in addition to procedure when the specimen breaks outside the middle third of the gage length.

The change in the specifications for wrought-iron plates provides detailed requirements for test specimens in place of a general statement.

The proposed revisions will receive subsequent consideration by the American Society for Testing Materials before becoming a part of the A.S.T.M. standards.

Walter F. Dixon

Walter F. Dixon, Works Manager, Singer Manufacturing Company, Elizabethport, N. J., and vice-president, Diehl Manufacturing Company, died June 8. Mr. Dixon was chairman of the ASA sectional committee on Electric Motor Frame Dimensions.

British Standards Body Reports Year's Activity

Organized nearly 35 years ago, the British Standards Institution has more than 700 committees. During the past year more than 1,000 meetings were held.

More than 150,000 copies of British Standard Specifications were sold by the Institution last year, according to the annual report.

FOR some considerable time prior to 1931, chemical interests in Great Britain had been watching the successful progress of industrial standardization in the engineering and allied fields and they felt, quite naturally, that work of a similar nature should be advantageous to the chemical industry.

It was at first thought that the British Engineering Standards Association, as the present Institution was then known, was not sufficiently flexible in its organization to allow chemical interests to enter the Standards Association and cooperate with the engineers on an equal basis. They were not prepared to come in and be in any way dominated by the engineers.

On the other hand, it was realized that to have more than one national standards organization in such a comparatively small country as Great Britain would be inimical to the best interests of industry generally and would tend to bring about many difficulties, particularly in so far as the Government Departments were concerned, and would almost certainly lead to overlapping of effort.

I therefore discussed the whole matter with the Director of the B.S.I. and later conferences took place, resulting in a Joint Committee being formed to explore the whole position. The present constitution was worked out and accepted by the engineers and by the chemical interests. At the same time the plan was accepted by the building interests, led by the Royal Institute of British Architects, who wished to cooperate more fully in the work but, at the same time, to secure that their industry could be left to manage their own affairs.

Thus it came about by unanimous agreement that the proposed new chemical standardizing body was incorporated with the B.E.S.A. in a na-

Great Britain's And Industrial

by

Dr. E. F. Armstrong, F.R.S.

*Chairman of the British Standards Institution
1934-35 and*

Chairman of the Chemical Divisional Council

tional organization, framed on the widest basis to meet the demands of the industry of the country as a whole.

The British Standards Institution was, therefore, formed, a supplementary Royal Charter being obtained mainly to authorize the change in title.

Four Divisions Organized

The work of the Institution is grouped into four main divisions: Building, Chemical, Engineering, and Textile, each division being supervised by a Divisional Council which has complete technical autonomy in its own field.

The affairs of the Institution as a whole are governed by a General Council, to which each of the Divisions elects annually nine representatives and so have an equal vote in the management. To this are added one or two representatives of the Government, the Federation of British Industries, and the Associated Chambers of Commerce.

Four Years of Progress

The Chemical Divisional Council held its first meeting in May, 1931. The progress made during those four years has, I think, amply justified the decision of the British chemical interests to undertake their standardization work on a national, rather than on a sectional basis. The experience gained in the earlier years of the B.S.I. have proved invaluable to the chemical industry in the development of a progressive policy.

The branches of the Chemical Industry, which

Kicks up Dust, Gets Things Done

Chemical Industry Standardization

How Chemical Manufacturers Found the Secret of Greater Efficiency and Economy in the National Standards Movement

were anxious to preserve their freedom, have found their rights have been protected by the established policy of the Institution of only issuing British Standards which have received the general consent of the interests concerned.

The growth of the chemical work during these years has been greater than was anticipated. Practically every branch of the Chemical Industry cooperates and all the relevant organizations take an active part, being officially represented on the Committees. It is gratifying to record the readiness of those organizations which have been doing pioneer work in the field of standardization to place the results at the disposal of the Institution.

Work Covers Wide Range

The standardization work which is being undertaken covers a wide field and includes the setting up of standards for the quality of widely differing materials, the establishment of standard methods of test, dimensional and quality standards for a wide range of scientific apparatus and laboratory ware.

As far as the quality of industrial materials are concerned, specifications have either been published, or are in the course of preparation, for vegetable, fish, and marine animal oils, tar products (such as creosotes, tar acids, phenol, benzoles, xyloles, toluols, etc.), solvents (such as alcohols, acetates, phthalates, etc), chemicals for electro-plating, carbide of calcium, and others.

The work carried out in regard to the standardization of methods of test includes the sampling



Times Wide-World photo

In his annual report, Dr. E. F. Armstrong, Chairman of the British Standards Institution, said in part:

"Any active body must occasionally kick up a little dust and engage in activities which pinch a little here and there, and cause a certain amount of disturbance.

"During the year the Institution has successfully met some of these difficulties. We have dragged them out into the open, and in friendly conference we have been able to solve them."

of coal and coke, glues, disinfectants, and dairy products, while the standards which are being set up for laboratory ware and scientific glassware covers volumetric glassware, hydrometers, thermometers, silica, and porcelain ware, together with standard forms of apparatus for such tests as distillation.

I hope I have said enough to indicate the large amount of work which is being carried forward. The chemical industry is a comparatively new one and, as everyone recognizes, is today progressing

Wide Range of Chemical Standards in Program

The British Standard Specifications developed by the Chemical Division follow:

Portable Chemical Fire Extinguishers of the Acid Alkali type.

General Purpose Laboratory Thermometers.

Graduated Measuring Cylinders.

Crow Receivers.

Petri Dishes.

Nessler Cylinders.

New and revised chemical specifications, in course of preparation by the Institution are:

Ampoules; Bolt Head Flasks; Clinical Thermometers; Combustion Boats (porcelain); Conical Flasks; Crucibles; Dean and Stark Receivers; Density Hydrometers; Distillation Apparatus; Flasks with Graduated Necks; Flat and Round Bottom Dishes; Flat Bottomed Flasks; Graduated Pipettes; Haemacytometer Pipettes and Counting Chambers; Laboratory Incubators; Water Bath and Oven Thermometers; Lactometers; Meteorological Thermometers; Polenske Apparatus; Straight Pipettes; Sugar Flasks, and Ubbelohde Apparatus.

Other chemical work includes specifications and methods of test for Coal and Coke, Coke Ash, Swelling Tests of Coal; work on Cresylic Acid and Phenol; Dairying Standards; Disinfectants; Electroplating; Glues; Leather and Tanning Materials; a wide range of Vegetable Oils; Tar Products; Solvents, and Viscosity in Absolute Units.

at a tremendous rate. New problems are continually arising, both commercial and technical, and the industry is fully persuaded that these problems can only be dealt with effectively by the coordinated effort of all concerned.

It is, therefore, a source of satisfaction to those responsible for the direction of the industry that there is at hand, in the Chemical Divisional Council of the British Standards Institution, a ready means whereby consideration can be given, on a national basis, to questions of standardization and simplification and to the setting up of universally agreed standards of comparison for the rapidly increasing number of chemical materials used by industry generally.

The real achievement of the B.S.I. lies deeper than the actual work done, because the Institution is always bringing together more and more people who are working for the common cause. It has proved itself to be a body which is impartial, able to get things done, possessing more than a modicum of tact, so that increasingly all sorts of different problems are brought to it and

it is being asked more and more to undertake to smooth out industrial difficulties, and I feel that the more than 5,000 members occupied in this national work are really doing useful and valuable work for industry and the country.

Simplify Packaging of Auto Engine and Air Brake Parts

Simplified Practice Recommendation R161-35, Packaging of Automotive (Bus) Engine Parts, and Simplified Practice Recommendation R162-35, Packaging of Air Brake Parts, have been accorded the required degree of written approval and are effective from September 1, 1935, according to an announcement by the Division of Simplified Practice, National Bureau of Standards.

These recommendations, which were proposed by the American Transit Association through its Purchases and Stores Committee No. 2 on Standard Packages, list the number of units per package best suited for the requirements and convenience of the transit companies in storing, unit piling, inventorying and distributing parts for buses and electric railway cars. Attention is invited to the fact that manufacturers and distributors of parts may ship any number of standard packages in a shipping container.

The recommendation for packaging automotive (bus) engine parts covers 26 different items, such as intake and exhaust valves, pistons, connecting rods, bearings, etc.

The recommendation for packaging air brake materials covers 28 different compressor parts and 16 different governor parts, such as gears, pinions, bushings, carbon brushes, valves, etc.

Until printed copies are available, complimentary copies of these Simplified Practice Recommendations in mimeographed form may be obtained from the Division of Simplified Practice, National Bureau of Standards, Washington, D. C.

Tells How to Buy Shoes and Stockings

"Shoes and Stockings" is the title of one of the most recent pamphlets in the Better Buymanship series of the Household Finance Corporation. Points to examine when purchasing shoes and stockings, and instructions for proper care are given in the booklet.

Other pamphlets already published in the series are: Poultry, eggs, fresh fruits and vegetables; sheets and pillow cases, blankets, table linen, bath towels; and canned fruits and vegetables.

World's Leading Electrical Experts Advance Many Standards Projects

More than 450 delegates from 20 nations, who met as the "world parliament of electricians" June 18 to 27 at The Hague and Brussels, approved standards on technical vocabulary, rating of machinery, measurements, and testing. The meeting marked the thirtieth year of the International Electrotechnical Commission. There are now 26 nations represented in this work.

In addition to the national committees of countries already members of the Commission, the formation of a Chinese Electrotechnical Committee to participate fully, as a member, in the work of the IEC, was announced. The Chinese Charge d'Affaires in Brussels attended the Council meeting on behalf of the Institution of Electrical Engineers in China.

A representative of the Ministry of Communications of Yugoslavia is also taking the steps necessary for his country to become a member of the IEC.

Much Work Accomplished

Among the important approvals voted by the Commission were several sections of an International Electrotechnical Vocabulary, which were approved for publication.

The fourth edition of the Rules for the Rating of Electrical Machinery (including transformers), together with rules for the measurement of high voltages by means of sphere-gaps, were approved for publication.

A series of publications on steam turbines was completed by the adoption of rules on instruments and methods of measurement for use in acceptance tests.

Tentative agreement was reached regarding the standard resistivity of aluminum for electrical purposes.

An international specification for the testing of overhead line insulators and a comprehensive comparison of the regulations for overhead power transmission lines in force in different countries are now ready for publication.

A general outline of the scope of a proposed revision of the international specifications for traction motors was agreed upon.

A report on the tests which have been carried out by an international subcommittee on insulating oils was discussed, and a program of further investigations decided upon.

An international specification for electrical measuring instruments will be circulated to the National Committees for approval, and it was decided to set up a committee to study the properties and methods of testing electrical insulating materials. Rules for the marking of the terminals on electrical machinery and apparatus were discussed, and a substantial measure of agreement was reached.

A revised draft specification for the rating and performance of oil-immersed circuit-breakers is to be circulated.

A committee on electrical installations on ships held its first meeting, and a number of subcommittees were set up with a view to coordinating the present practice of the various countries.

Progress has been made in the drafting of an international specification for internal combustion engines.

An international specification for the testing of high-voltage paper-insulated lead-covered cables was agreed upon for circulation to the National Committees for approval.

The next plenary meeting of the International Electrotechnical Commission will be held in England in June, 1928, the Council of the IEC announced.

American Inventor Heads International Committee

Dr. James F. Burke, member of the United States National Committee of the International Electrotechnical Commission, was unanimously elected president of the IEC to succeed Dr. A. F. Enstrom, Sweden, at the last meeting of the plenary session of the Commission at Brussels, June 27.

Mr. Burke for many years has been a member of the U. S. National Committee and has made valuable contributions both to the work of the USNC and the IEC.

He is a past-president of the Electric Light and Power Group and is widely known as an inventor. His patents include designs for a generator winding by which three-wire service from a single machine was made possible, and a motor for opera-

tion on either a-c or d-c supply. He served on the U. S. National Committee as representative of the National Electrical Manufacturers Association from 1914 to 1930, and as representative of the American Institute of Electrical Engineers from 1930 to 1932. He recently retired from the Burke Electric Company of Erie, Pa., of which he was chairman of the board, after more than 30 years as active head of the company.

Dr. Elihu Thomson of the United States, and Professor P. Janet of France were elected honorary presidents of the International Electrotechnical Commission, and Colonel K. Edgecumbe of Great Britain was re-elected honorary secretary.

Dr. Thomson is director of the Thomson Laboratory of the General Electric Company. More than 700 patents have been obtained under his direction. He is inventor of electric welding, which bears his name, and many other important inventions in electric lighting and power. He has received numerous medals for his outstanding achievements. He was awarded the Grand Prix in Paris in 1889 and 1900 for his electrical inventions, and was decorated in 1889 by the French Government. He is a Chevalier and officer of the Legion of Honor for electrical research and inventions.

Federal Housing Administration Joins ASA as Member-Body

The Federal Housing Administration, government agency in charge of mortgage insurance and financing of remodeling projects, has become a Member-Body of the American Standards Association.

Development of standards for residential property to be financed by the Administration is one of the important phases of the work of the Federal Housing Administration. These standards not only determine whether a property shall receive the benefit of the Government's financing program, but also encourage improvement in housing standards and conditions.

Not only the construction, planning, and accommodation of a dwelling are taken into consideration in the Administration's standards, but also the character of design, the neighborhood standards, relation of property to the neighborhood, and the way the land is put to use. Reference has been made in the standards already completed to the National Electrical Code, approved by the American Standards Association, and to the Minimum Requirements for Plumbing of the Department of Commerce. As the work of the Administration develops, it is expected that other nationally recognized standards for materials, equipment, and methods of construction will be used.

A comprehensive study of building codes and ordinances and their effect upon residential properties as security for mortgage loans is being considered by the Administration.

Cooperation with the American Standards Association as a Member-Body is expected to facilitate this standards work of the Federal Housing Administration.

British Plan Specifications For Standard Housing Units

A comprehensive program of standardization in the building industry of Great Britain has been inaugurated through the cooperation of the Building Industries' National Council and the Building Divisional Council of the British Standards Institution. The National Council is a member of the Standards Institution's Council, which includes representatives from all other building interests, such as the Royal Institute of British Architects, the Chartered Surveyors' Institution, the National Federation of Building Trades' Operatives, the National Federation of Building Trades Employers, Building Materials Manufacturers' and Suppliers' Committee, etc.

Industry Accepts Amendment to Commercial Standard on Shingles

An amendment to the Commercial Standard for Wood Shingles has been adopted by the standing committee of the industry under the procedure of the National Bureau of Standards, to facilitate the use of wood shingles for side-walls and the estimation of cost of wood shingles for that purpose. The amendment establishes "side-wall squares" consisting of three bundle packs of 16 in. and 18 in. shingles. It was proposed by the Director of Standards of Massachusetts.

Frank O. Wells

Frank O. Wells, proprietor of the Wells Manufacturing Company, Greenfield, Mass., died June 23. Mr. Wells, widely known as an authority on taps and dies, was vice-chairman of the American Standards Association committees on Screw Threads and on Bolt, Nut, and Rivet Proportions. Throughout the existence of the National Screw Thread Commission, (1918-1933), Mr. Wells also was one of the two members representing the American Society of Mechanical Engineers on this body, and thus played an important part in securing coordination between the activities of the ASA committees dealing with threads and threaded products, and the National Screw Thread Commission.

New Federal Specifications Board Named to Write Purchase Standards

THE Federal Specifications Board, the responsible agency for preparing Federal specifications to which purchases of all Government departments must conform, has just been reorganized. The new organization will be known as the Federal Specifications Executive Committee, and will consist of the chairman, vice-chairman and technical secretary, and technical liaison representative from five of the larger Government departments and establishments.

The newly appointed members of the Committee are:

Dr. Lyman J. Briggs, Director, National Bureau of standards, *chairman*.

N. F. Harriman, Technical Assistant to the Assistant Director, Branch of Supply, Treasury Department, vice-chairman and technical secretary.

Captain Albert Norris, Navy Department.

Lt. Col. John Mather, War Department.

Alex McC. Ashley, Department of Agriculture.

C. S. Beard, Post Office Department.

The Federal Specifications Executive Committee functions under, and is solely responsible to, the Director of Procurement, Treasury Department.

In addition to the five technical liaison representatives who are members of the Executive Committee, technical liaison representatives have been named in each of the other Government departments and establishments to act as official contacts between their respective departments and the Executive Committee. Proposed specifications are sent to these representatives for comment and criticism, and they assist in selecting the specialists who constitute the various technical committees which prepare the specifications.

First Board Formed in 1921

The duties and procedure of the technical committees will be the same as they were in the former Federal Specifications Board.

The Federal Specifications Board was organized to coordinate the requirements for supplies

and materials purchased by the various Government departments, and to establish scientific, uniform purchase standards. It was originally organized in 1921, shortly after the appointment of a Chief Coordinator to act under the Director of the Bureau of the Budget in applying uniform business principles and methods in the preparation of purchase specifications for use in the conduct of the Government's business. Several coordinating boards, each having to do with specific phases of the Government's activities, were organized under the direction of the Chief Coordinator, of which the Federal Specifications Board was one. The other boards were the Federal Purchasing Board, the Federal Liquidation Board, the Federal Traffic Board, the Federal Real Estate Board, and the Interdepartment Board of Contracts and Adjustments. The work of all of these coordinating boards has been absorbed by the new Procurement Division of the Treasury Department.

1,000 Specifications

Each department purchasing materials and supplies in accordance with specifications designated a representative to serve as a member of the Federal Specifications Board and the members constituted the complete Board.

The object of Federal Specifications was to bring about economies in the procurement of materials purchased by the Government, and to avoid duplication of effort between departments. The adoption of standard specifications for materials brought the Government specifications into harmony with the best commercial practice wherever conditions permitted. Approximately 1,000 Federal Specifications have been promulgated.

The newly organized Federal Specifications Executive Committee will operate in practically the same way as the original Federal Specifications Board. The need for specifications for a given article or material will be considered, and if found to be necessary, the proposal for preparation of a specification will be referred to a technical committee composed of Government specialists in that particular subject. This technical committee will prepare a Federal specification for

the use of all executive departments and establishments of the Government.

The cooperation and advice of interested commercial and industrial concerns will be requested and their recommendations will be considered by the technical committees. The specification as agreed upon by the technical committee will then be submitted to all departments and establishments of the Government, through the technical liaison representative in each department, for comment and criticism.

All criticisms received will be referred back to the respective technical committees for consideration. When the specification is finally agreed upon, it will be approved by the Federal Specifications Executive Committee and promulgated by the Director of Procurement for use in connection with the purchase of material covered by the specification.

The specifications, when adopted and promulgated, are binding upon and govern all executive departments and independent establishments of the Federal Government, except in specific instances in which the specification does not cover the actual needs of the agency. In such cases of deviation, if the purchase exceeds \$1,000 in amount, a report is requested to be made to the Director of Procurement.

Copies of Federal Specifications promulgated by the Director of Procurement are available from the office of the American Standards Association as well as from the Government Printing Office, Washington, D. C. An index to the completed specifications and those now in process can be obtained upon request.

Eastman Kodak Company Becomes ASA Member

The Eastman Kodak Company, Rochester, N. Y., one of the largest American makers of cellulose and chemical products as well as cameras and kodaks, has become a Company Member of the American Standards Association.

In its acceptance of the invitation to become a member of the American Standards Association, the Eastman Company said:

"The Eastman Kodak Company fully recognizes the value of concentrated effort in promulgating national as well as international standards and specifications. We are cognizant of our responsibilities in supporting this work. Through the agency of the Society of Motion Picture Engineers we have cooperated toward advancing trade standards. In fact, the advantages of common practices and methods within our own organization led to our establishing a few years ago a Standards Department within the Company.

"It seems to us that the functions of your organization in coordinating the efforts of the many societies engaged in this type of work are of very definite value to American industry, and for this reason to the Kodak Company. We feel that your work is worthy of our support, and we would like to accept your invitation to take out a Company Membership in the American Standards Association."

Committee Urges Railways To Use Materials Standards

Specifications for castings, forgings, wheels, steel sheets and other items used by the railways have been revised and brought up to date during the past year, the Committee on Specifications for Materials, Mechanical Division, Operation and Maintenance Department, of the Association of American Railroads reports.

The committee is now considering specifications for bolts and nuts and a revision of specifications for rivets to agree with the recommendations of the American Standards Association.

The committee hopes to make the specifications acceptable to all members of the AAR in order that they will be used in preference to specifications of individual roads. This is difficult because of the continual change in requirements due to experimental work on materials and new designs. Members of the AAR who use the specifications and find them inadequate are requested to send their criticisms and suggestions to the secretary in order that the committee can take them into consideration in their work during this coming year.

A.S.T.M. Publishes Standards For Preservative Coatings

All of the standards for preservative coatings for structural materials, which include paints, varnishes, lacquers, and paint materials, approved by the American Society for Testing Materials, have been compiled and published in one volume by the A.S.T.M. One hundred three specifications and methods of test for pigments, oils and thinners, varnish and varnish materials, lacquer and lacquer materials, and miscellaneous materials and subjects are published in full in the book.

The latest approved form of each of the standards is the one given.

The book, 378 pages, in a heavy paper cover, is available from the American Society for Testing Materials, 260 South Broad Street, Philadelphia, at \$1.75. Special prices are in effect on orders of ten or more copies.

Railroad Standards Chairman Urges Records Be Kept to Show Savings in Simplification

Closer cooperation between the simplification and standardization committees of individual railroads and terminal companies in simplifying and standardizing terminal stock was recommended recently. This proposal was a leading item in a report of the Simplification and Standardization Committee, Purchase and Stores Section, Division of Operations and Maintenance of the Association of American Railroads.

The report, presented at a meeting in Chicago on July 23 and 24 was one from about 20 committees dealing with purchasing, storage, scrap, accounting, standardization, and various other phases of railway supply operations.

Definite information concerning savings effected through standardization and simplification can be obtained, A. G. Follete, chairman of the committee, reported, if adequate records are kept by the railroad simplification committees. He suggested reports showing items of stock eliminated, total book value of stock, cubic feet of bin space and square feet of platform space released for more active materials, book value of surplus or obsolete material disposed of, and cubic feet of space so released.

The report further discussed the degree of adherence to a number of Simplified Practice Recommendations developed in cooperation with the National Bureau of Standards, U. S. Department of Commerce. The extent of adherence is shown in the table.

Manufacturers of unit-cell flashlight batteries should standardize on a uniform package quantity in order that satisfactory arrangements can be made for repayment of freight, the committee recommends. Varied methods of packaging these batteries make it difficult to arrange for prepaying freight on orders of 100 lb weight or over.

Manufacturers of lanterns and representatives of the railroads have met for standardization of hand lanterns, and the Signal Section will be requested to develop a skeleton design for hand lanterns to allow interchangeability of globes and founts and for adjustable bails, and possibly interchangeability of burners.

Vote for Fewer Drill Sizes

Of the 147 sizes of drills reported in use by 27 representative railroads, 31 sizes are recommended as standard. Seventy-four sizes of cap screws are recommended in place of the 288 sizes and threads now in use. The committee recommends

	Reports	Total Adherence	Partial Adherence
Woven wire fencing -----	31	27	4
Forged tools (See AREA track tool manual) -----	30	21	9
Asbestos mill board and paper -----	30	25	5
Steel barrels and drums -----	26	24	2
Cotton duck -----	34	27	7
Milling cutters -----	27	17	10
Grinding wheels -----	32	21	11
Carbon brushes -----	30	23	7
Packaging of carriage, machine and lag bolts -----	33	25	8
Roller bearings -----	21	17	4
Metal and fibre flash-light cases -----	25	22	3
Turn buckles -----	30	24	6
Skid platforms -----	21	17	4
Packaging of flash-light batteries -----	31	27	4
Wire insect screen cloth -----	30	24	6
Metal lath -----	19	17	2
Asphalt -----	16	14	2
Steel lockers -----	21	17	4
Steel reinforcing spirals -----	20	18	2
Steel reinforcing bars -----	27	25	2
Steel windows, solid section -----	17	15	2
Metal partitions for toilets and showers -----	16	13	3

44 sizes of hand and machine screws in place of the 228 diameters and threads now being used.

The list of brushes recommended in 1929 has been revised to standardize quality and length of bristles for each type of brush within certain tolerances. Because bristles and hair used in the manufacture of brushes are natural by-products and, therefore, quality and length are not entirely under control of either the producers or the manufacturers of brushes, it is considered impossible to establish a single quality and length of bristles for similar brushes, and it is recommended that more than one grade be provided for brushes for similar purposes.

John Bath

John Bath, president and treasurer, John Bath & Company, Inc., Worcester, Mass., manufacturers of ground taps and other small tools and internal micrometers, passed away on July 9. Mr. Bath was a member of the committee on Plain Limit Gages for general engineering work which developed the American Tentative Standard for Tolerances, Allowances and Gages for Metal Fits, approved in 1925.

Electric Tuning Fork Holds Accurate Pitch

A scientifically accurate basic standard of frequency which may be used as a reference for the determination of musical pitch, one of the important scientific requirements of the musical world, has been announced by Horatio W. Lamson, Research Engineer, General Radio Company.¹

The standard consists of an electromagnetically driven tuning fork, the tines of which are kept in vibration at constant amplitude by a synchronous pulsating current flowing in an electromagnet acting on them.

A sensitive microphone is mounted on the tuning fork in such a manner that, while the microphone is energized by the vibration of the fork, it does not appreciably load the fork and influence the damping and frequency of the latter. The synchronous pulsating currents produced by this microphone are of sufficient intensity to operate the driving magnet directly.

"These so-called microphone-driven tuning forks," Mr. Lamson says, "may be made with sufficient stability to be at all times reliable standards of musical pitch and to meet the most exacting requirements of the musical world. Such standards are compact, relatively inexpensive, simple to operate, and may be energized by a small battery of flashlight dry cells or, if desired, may be driven by any convenient source of alternating or direct current."

Older Devices Inaccurate

The tuning fork, the tuning bar, the organ pipe, and the vibrating reed of the familiar pitch pipe, any of which may be used for determining musical pitch, all have disadvantages when an attempt is made to use them as highly accurate and unalterable standards of pitch, Mr. Lamson points out. The tuning fork and bar produce tones having considerable purity but these tones are attenuated quite rapidly, and have, accordingly, such a short duration as to limit accurate unison observations. The organ pipe, on the other hand, may produce a sustained tone suitable for accurate unison measurements but its fundamental pitch is, of course, irretrievably a function of temperature. The pitch pipe, so widely used as a reference standard of pitch in vocal music, besides being quite impure in the texture of its musical tone is the least accurate standard of those mentioned.

Mr. Lamson outlines the specifications for a precise standard of musical pitch, as follows:

Such a standard should be capable of produc-

ing a musical tone which is constant at some predetermined frequency, such as A equals 440 cycles or double vibrations per second, to within at least 1/10 of one per cent, irrespective of temperature or other atmospheric conditions. The musical tone produced therefrom should be unattenuated with time, reasonably pure in its composition, free from all inharmonic components, and of sufficient volume to meet all musical requirements. The device should be simple and thoroughly reliable in operation.

Safety Winners in Mine Competition Announced

Outstanding safety records during 1934 won for five mines and quarries awards of the National Safety Competition. The five operating units represented anthracite mines, bituminous mines, metal mines, other mines and quarries, or open-cut mines, respectively. Three hundred and thirty-four quarries and mines entered the competition.

One of the winners was the Lawrence mine (anthracite) of the Harleigh-Brookwood Coal Company, Schuylkill County, Pennsylvania. It was operated 727,979 man-hours and had only 53 lost-time accidents resulting in 857 days of disability.

The Union Pacific Coal Company's "C" mine (bituminous), Superior, Wyoming, worked 225,426 man-hours without a lost-time accident.

East Vulcan mine of the Penn Iron Mines Company, Norway, Michigan, operated 288,828 man-hours without a lost-time accident.

Marquette Cement Manufacturing Company's LaSalle mine at Oglesby, Illinois, operated 105,376 man-hours without a lost-time accident.

Rogers City Limestone quarry of the Michigan Limestone & Chemical Company, was operated 727,503 man-hours without a lost-time accident. This mine was the 1929, 1932, and 1933 winner in this group, also.

This annual competition is sponsored by the United States Bureau of Mines. Director John W. Finch made the announcement.

Vote on New Procedure For Determining Manganese

A modification of the procedure for determining manganese by the persulfate method is being voted upon by the American Society for Testing Materials as a revision of the Methods of Chemical Analysis of Manganese Bronze (ASA K3-1921; A.S.T.M. B27-19). It is recommended by the Society that the revised methods be approved by the American Standards Association following their adoption by the A.S.T.M.

¹Journal of the Acoustical Society of America, July, 1935.

A.S.T.M. Paint, Varnish and Lacquer Symposium Shows Rapid Progress on Technical Problems

The Symposium on Paint and Paint Materials, comprising 15 technical papers and discussion presented at the 1935 Regional Meeting of the American Society for Testing Materials, has been published by the A.S.T.M. Almost all phases of the paint, varnish, and lacquer industry are covered in a comprehensive technical manner.

Each of the authors, an outstanding technologist in his field, prepared his paper from a broad viewpoint, and the information and data presented are of particular interest to the consumer as well as those concerned with phases of production.

The papers included in the Symposium are:

Looking into the Future—H. A. Gardner, Chemical Engineer, The Institution of Paint and Varnish Research.
Preparation, Use, and Abuse of Specifications for Paint Materials—P. H. Walker, Acting Chief, Chemistry Division, National Bureau of Standards.
Protective and Decorative Coatings for Railway Passenger Car Equipment—A. M. Johnsen, Engineer of Tests and Chemist, The Pullman Co.
Paint Testing—C. D. Holley, Director of Paint Research, The Sherwin-Williams Co.
Varnish Testing—W. R. Fuller, Technical Director, Pratt & Lambert, Inc.
Lacquer Testing—H. E. Eastlack, Director, Parlin Laboratory, E. I. du Pont de Nemours and Co.
Drying Oils—S. O. Sorensen, Chemist, Archer-Daniels-Midland Co.
Titanium Pigments—I. D. Hagar, Eastern Sales Manager, Titanium Pigment Co.
The Mineral Earth Colors and Synthetic Iron Oxides—J. W. Ayers, Director of Research, C. K. Williams and Co.
Chemical Colors—A. F. Brown, General Manager, Imperial Color Works.
Natural and Synthetic Resins—W. T. Pearce, in Charge Sales Promotion and Development, The Resinous Products and Chemical Co.
Lacquer Solvents and Volatile Thinners—R. M. Carter, Research Chemist, U. S. Industrial Alcohol Co.
Turpentine and Petroleum Distillates as Thinners for Varnish and Paint—J. M. Schantz, Manager, Technical Service, Naval Stores Dept., Hercules Powder Co., Inc.

The discussion of the papers, also included in the book, gives various viewpoints on the problems presented, and shows a broad view of the field.

The Symposium makes available authoritative information and indicates the progress made in the paint industry.

Copies of the Symposium on Paint and Paint Materials, 150 pages, can be obtained from the American Society for Testing Materials, 260 S. Broad Street, Philadelphia, or can be ordered through the office of the American Standards Association at \$1.50 for cloth binding, \$1.25 paper cover.

Performance Specifications Help Paint Purchaser

The necessity for specifications as a basis of fair competition is of vital importance to consumers and manufacturers in the purchase and sale of paint materials due to the limitations of casual and visual inspection.

Any specification used as a basis of purchase should be as simple and concise as possible. It should in clear, direct statements indicate the characteristics and services of the product. Its preparation requires the combined services of the engineer, the chemist, the consumer, and the manufacturer. The results of their conclusions should be reviewed by the lawyers to determine whether or not the phraseology used definitely sets forth the true intent and the elimination of more than one interpretation. . . .

Many people have the impression that when a specification is developed and finally adopted the job is completed. This is only the beginning. A specification must constantly be kept alive by keeping pace with industrial progress or in correcting defects which develop in service if it is to be of any value. To attempt to apply a specification that no longer reflects the existing products is wrong and to a certain extent nullifies its real purpose. . . .

I believe that a strictly performance specification is the ideal which we should strive to attain. It will tend to encourage ingenuity and stimulate initiative action in the paint industry and will help the consumer to make tests that are comparable to the service he expects to receive in the use of a material.—H. E. Smith, *Materials Engineer, White Plains, N. Y., in the Symposium on Paint and Paint Materials, published by the American Society for Testing Materials.*

A.S.T.M. Asks ASA to Approve Revised Analysis of Lead

The American Society for Testing Materials has asked the American Standards Association to approve a revision of the Standard Methods of Routine Analysis of Dry Red Lead (ASA K16-1933; A.S.T.M. D49-33), following its approval by the A.S.T.M. The revision consists of a modification of the procedure for determining total lead and insoluble matter.

Safe Gear Loads Differ In America and England

In a comparison of the British Standard Specifications for Machine-Cut Gears with the standard recommended by the American Gear Manufacturers Association, F. A. Mickle of the University of Michigan, writing in *Machinist, London*, points out that the safe loads given by the two standards vary widely. As the speed reduction increases, the capacity as computed by the British method increases, and even at a 9:1 reduction is still smaller than the safe load given by the American Gear Manufacturers Association standards. As

the speed increases, British values are subject to greater change than the loads given by American practice.

In the smaller gear sizes the British formula is more conservative, whereas in the larger sizes the A.G.M.A. method results in lower loads.

A tabulation of the comparison of British and American Standards for helical gears, which is shown here, indicates that the differences between the results of the two methods are too great, Mr. Mickle said.

Comparison of British and American Standards for Helical Gears

Horsepower per inch width of face

Pitch Diam.	Pitch No.	Speed r.p.m.	Horsepower		
			British Standard		A.G.M.A.
			1-1*	9-1*	Any*
3	6	100	1-48	1-93	2-13
		900	8-60	11-15	15-14
		3600	23-97	31-07	48-04
3	12	100	1-04	1-18	1-28
		900	6-03	6-85	9-09
		3600	16-79	19-09	28-83
18	1	100	46-3	69-3	62-8
		900	310	401-0	395-0
		3600	863	1117-0	1088-0
18	4	100	22-6	—	20-5
		900	130	—	129-0
		3600	364	—	356-0

* Gear reduction

Performance Specifications Encourage New Lamp Designs

Although original standards of lighting effectiveness, safety, and construction have been retained in the Illuminating Engineering Society's specifications for lamps certified by the Society, dimensional and material requirements have been eliminated to encourage freedom of design. The revision is expected to stimulate manufacturers to create new designs. Present requirements are just as rigid as before, and inferior lamps cannot now be railroaded through "loopholes" to certification, says a report on the results of the first year of certification published in the *Transactions of the Illuminating Engineering Society*, July, 1935.

Forty-nine manufacturers in the United States and six manufacturers in Canada were authorized to attach Tags of Certification on their lamps dur-

ing the first year. In Canada, the Hydro-Electric Power Commission in Toronto acts as the testing laboratory to authorize certification.

Industry Reaffirms Two Simplified Recommendations

The Division of Simplified Practice, National Bureau of Standards, has announced that the following Simplified Practice Recommendations have been reaffirmed without change by the standing committees of the industry:

Polished Cotton Twine R124-31
Roofing Slate R14

Copies of the recommendations can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at five cents each.

American Screw Thread Standards Are Approved

(Continued from Page 239)

largest or smallest pitch diameters are outside the maximum or minimum limits set for the desired fit.

Bad finish carries the added disadvantage of making the accurate measurement of the screw practically impossible within the desired tolerance limits.

No attempt has been made to incorporate these important elements into the standard, as their control does not yet seem practicable on a definite measurement basis. However, as we shall see, improved cutting tools and new gaging developments are working toward a solution of the problems of finish.

The Attainments of Standardization

The setting up of standards is one thing. Their attainment in actual practice is quite another.

Some of the difficulties and complexities involved in the determination of tolerances for form, lead, pitch diameter, major diameter, minor diameter, etc., have been detailed above. When all these considerations are balanced against the desired quality of the product for its proper functioning, the allowable variation in pitch diameter seems impracticably small.

In the United States, where the amount of standard threading is perhaps the greatest, and a demand for radical revision the least, certain conditions have been attained which appear to make the theoretically desirable tolerances practically possible. These fortunate conditions are (1) accurate threading tools, and (2) improved methods of gaging.

Accurate Threading Tools. In the endeavor to meet the requirements of a standard, the first efforts should be directed toward the tools with which the threads are cut. It is folly to endeavor to meet the requirements with commercial tools made without reference to standards.

Where requirements are exacting, the solution of the problem lies in the use of ground thread taps and chasers, in which the lead and form errors have been reduced to a minimum. This leaves practically the full pitch diameter tolerance available for tool adjustment and tool wear; and when the full tolerance is thus available, it is ordinarily found to be sufficient.

An added advantage of the ground thread cutting tools is that they may be furnished in high-speed steel. Since these tools receive their accurate shape *after* hardening, the hardening may be done with reference to cutting qualities alone,

and without reference to preserving accuracy. This fact permits the making of taps and chasers of cutting qualities superior to any hitherto attained.

Gaging Methods. The certainty of attaining standard measurements and standard fits is greatly complicated, as has been already described, by the fact that the final fit is a cumulative result of errors in form, lead, pitch diameter, concentricity, and finish.

The older methods took account of one element only—pitch diameter. Later elaborations employed a multiplicity of gages for the separate elements, and endeavored to discover the final effect on the fit by calculation. The matter of gage wear also complicated the situation.

The use of optical gaging eliminates these difficulties. Gage wear is avoided by using a master gage for reference only. The cumulative effect of errors of lead, form, pitch diameter, drunkenness, and finish may be automatically totalled and shown immediately and directly by the displacement of a projected tooth form on a tolerance chart.

Another advantage of this method is the fact that it shows the separate elements of the fit, as well as the cumulative effect. The inspector knows which element is wrong, so does not try to change the pitch diameter when the form is defective, and vice versa.

It furthermore shows the changes in the elements of accuracy before they become serious, so that remedial action can be taken in time. In this respect it contrasts with the "go" and "no go" gage method, in which there is no indication of trouble until the limit has been reached.

The apparatus (as furnished by different makers) is rapid as well as effective. It has been the leading factor in the improvement of threading tools themselves, as well as finding wide use in the inspection of threaded product.

Conclusions

The standardization of screw threads is desirable from the standpoints of interchangeability, proper functioning, and cheapness of production.

Suitable standards have been set by the authorized standardization bodies of several leading industrial nations. This latest revision of our own standard is based on a decade of wide practical use during which the theoretical considerations have been subjected to test and modification.

Improved thread-cutting tools and means for gaging are now available, which bring any reasonable standard into the class of cheap production.

Standardization thus reaches its goal — "The best product at the lowest price."



Screw Threads

for Bolts, Nuts, Machine Screws
and Threaded Parts

Approved by the
American Standards
Association

65c

AMERICAN STANDARDS ASSOCIATION 06

29 West 39th Street New York